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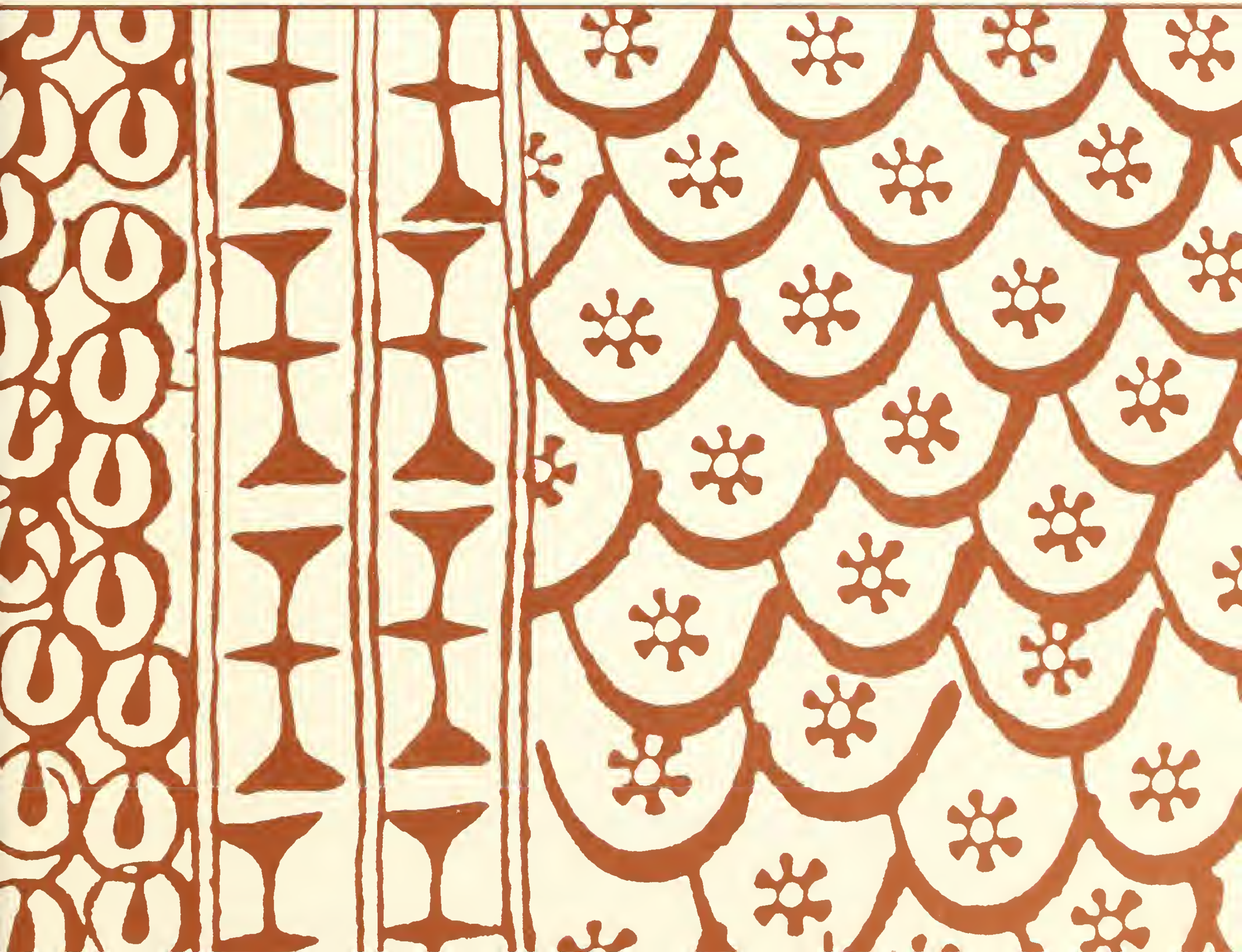

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Coffee Production in Africa

By J. Phillip Rourk

Sugar and Tropical Products Division

September 1975

Foreign Agricultural Service

Foreword

The African Continent, in approximately 50 years, has increased its share of world coffee production from about 1 percent of total output to between 25 and 30 percent. This extra-ordinary growth may be attributed to several factors, certainly including high coffee prices during various periods. But other important factors were the relative abundance of low-cost labor and the policies pursued by the major colonial powers following World War II as they sought to provide small farmers with a cash crop to supplement the traditional subsistence agriculture of the area.

Beginning in the late 1940's and early 1950's intensive official coffee expansion campaigns were launched in a number of African countries. Research stations were established, extension services were brought into being, and were often provided with free seedlings, technical advice, and easy credit. Subsequently, state marketing boards were set up to ensure a market for the farmers' production at stable (though sometimes low) prices. In some countries, too, cooperatives were organized. The result was a spectacular increase in production, particularly in the decade from the mid-1950's to the mid-1960's. Since the mid-1960's, growth has slowed down, probably due, in part at least, to prevailing low prices and the elimination of some services following independence.

The African Continuent has also become increasingly important as a source of coffee for the U.S. market during the past two decades.

Before World War II, U.S. coffee imports from Africa were primarily *arabica* coffees supplied by the countries comprising British East Africa. For the period 1935-39 they averaged only 220,000 bags, about 1.5 percent of our total coffee imports. By the early 1950's the balance had shifted toward *robustas* for use by the rapidly expanding soluble coffee industry. Since 1951, when imports from Africa constituted 4.8 percent of total coffee imports, these coffees have steadily increased their share of the U.S. market, reaching a peak of 33.4 percent of the total in 1970 and only slight less (33.1 percent) in 1974. It appears likely that Africa will continue to supply about one-third of U.S. coffee needs during the next few years at least.

This report is based largely on information obtained by the author during the course of two trips to Africa. In the case of those countries not visited, primarily minor producers, extensive use was made of the FAO publication, *World Coffee Survey*, among others. The author also wishes to express his appreciation for the valuable assistance furnished by U.S. Agricultural Attaches and other Embassy staff members in all of the countries visited.

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Coffee Production in Africa

By J. Phillip Rourk, Sugar and Tropical Products Division

Not too many years ago, Africa, known as the home of the *Coffea* species, exported only a few thousand tons of coffee annually, most of it harvested from wild forest trees. In the years since World War II, however, the development of coffee production has been extraordinarily rapid, and the continent now accounts for perhaps 25 percent of the total world harvest. Also, the area has great importance as the principal source of genetic material for the future.

Botanical species

The trees that produce the coffee of commerce, one of the most satisfying beverages known to man, belong to the genus *Coffea.* Because of the economic importance of this crop - world trade in coffee in 1973 was valued at about US $4.5 billion - the trees have received considerable attention, particularly in recent years. Nevertheless, botanists and other scientists have been unable to agree thus far on many details of their classification, and the total number of species in the genus remains a matter of controversy and uncertainty. During the past century various authorities have estimated the number of different species from a low of about 15 to as many as 100.

As might be expected, given the large number of species, the appearance of the coffee plant is extremely variable. Some species are small shrubs, the majority are small trees, while a few species are medium to large forest trees up to 65 feet in height. The leaves range in size from small to very large and in color from yellow to green and even purple. Fruit size is equally variable as is the color of the fruit at maturity, ranging from yellow through various shades of red, to almost black.

Although the exact number of species that may exist is mainly of academic and scientific interest at this time, the various species do provide a significant reservoir of germ plasm of widely differing characteristics which may prove to be of great importance to the coffee world at some future date.

Thus far only two species - *Coffea arabica* and *C. canephora* (commonly called *Robusta*) - are of commercial importance. One other - *C. liberica* is of very limited economic significance at this time and production from this specie is largely for consumption in the producing areas.

By far the greater proportion of the known species of coffee, including the two which provide the bulk of the world's commercial coffee, are indigenous to Africa. The two major species, *C. arabica* and *C. canephora*, are now grown in more than 60 countries spread over the four continents of Africa, Asia, North and South America. This is testimony not only to the great adaptability of the coffee plant but also to the energy and foresight of the Dutch, Portuguese, Spanish, French, and English who, concurrently with the rapid growth of their empires in the 17th, 18th, and 19th centuries, introduced and encouraged the production of this exotic tropical crop for export to the mother countries and other markets of Europe.

Early usage and spread of C. arabica

Unquestionably, the African peoples were the first to make use of coffee for human consumption. Just when this occurred is not known but it must have been sometime in the prehistory of the continent. It is believed, however, that the seeds were not utilized but, rather, a drink was prepared from an infusion from the coffee leaf or, alternatively, a tealike beverage from the dried coffee pulp. In fact, this latter method is still employed in many areas of Africa.

Evidence points to the Arabs, inhabiting what is now known as the Yemen, as those who first made use of the roasted and ground seeds (or beans) in the preparation of a beverage, though long before that the seeds had been chewed or eaten after first being ground into a mass and mixed, at times, with fat or other ingredients. Presumably, the stimulating effects of the cafeine were obtained in this manner.

C. arabica was the first coffee taken out of Africa. The chronology is uncertain, but it is thought to have reached Yemen about 575 A.D. from Ethopia, which is, without doubt, the ancestral home of *C. arabica*.

From Yemen it is believed to have spread, slowly at first, to other parts of the Arabia Peninsula. The rise of Islam, and its rapid march through the Near and Middle East and along the entire North African coast, greatly expanded the area where coffee was known and enjoyed. By the 16th century coffee had reached Europe, through Turkey, and by the early 17th century the Dutch were planting coffee trees in Ceylon with seeds brought from Yemen.

In the early 18th century coffee trees were also propagated in conservatories in certain European countries, including the Netherlands. From the Amsterdam conservatory a specimen tree of what was later to be denominated *Coffea arabica* was sent as a gift to King Louis XIV, who ordered construction of the first known greenhouse in France to shelter it. In later years the great Swedish scientist and taxonomist Linnaeus based his nomenclature of coffee on studies of this tree and its progeny. Since the tree was traced to Arabia (Yemen), via India and Java, he named the species *arabica*. In 1715 seeds and plants from this tree were shipped to Martinique, in the West Indies, and to the island of Bourbon, off the East African coast. From Martinique, seeds and plants reached the other islands and the mainland of the Western hemisphere. Thus, the tree in the royal greenhouse in Paris became the progenitor of the billions of *Coffea arabica* trees now growing in the Western Hemisphere.

Throughout the 18th century the Dutch, Portuguese, Spanish, French, and English were rapidly expanding their territorial conquests in the tropical latitudes around the world. Coffee was increasingly in demand, and production was relatively easy based on abundant and cheap native labor and the technology of the day. By 1800 *C. arabica* had spread virtually around the world.

So successful were the introduction and propagation of *C. arabica* that the countries of Asia and North and South America dominated, in fact almost monopolized, world trade in coffee. Even as recently as World War I the Continent of Africa produced on the average no more than about 250,000 bags of coffee of all species, at that time slightly more than 1 percent of world production. Rapid expansion of coffee production in Africa, primarily *C. canephora*, commenced in the 1920's, however, encouraged by the various colonial powers, and production surpassed 3 million bags by 1945. Since that time the industry has shown further rapid growth, stimulated by higher prices, special government campaigns and assistance, and the increasing acceptance of *robusta*-type coffees in world markets. Current production is about 20 million bags, some 25 to 30 percent of the world total. In 50 years, therefore, African production has increased 80 times. Although the relatively low prices of the 1960's and the constraints of the International Coffee Agreements brought a slackening of the pace, the production trend remains upwards:

In 1,000 bags of 60 kg. and 5-yr. average

1929/30 - 1933/34	1,215
1934/35 - 1938/39	2.145
1939/40 - 1943/44	2.867
1944/45 - 1948/49	3,583
1949/50 - 1953/54	5.016
1954/55 - 1958/59	8,483
1959/60 - 1963/64	14.396
1964/65 - 1968/69	17.131
1969/70 - 1973/74	19.750
1974/75	19.917

Source: 1929/30 - 19 59, Food and Agriculture Organization. 1959/60 - 1974/75, FAS.

Present status in Africa

Slightly more than 25 percent of Africa's present coffee production is of the *arabica* type (*C. arabica*). Major producers, in descending order of importance, are Ethiopia, Kenya, Tanganyika, Cameroons, Burundi, Uganda, Rwanda, Rep. of Zaire, and Angola.

Given the fact that *C. arabica* is native to the African Continent and produces a flavorful aromatic beverage of high quality, it may be wondered why a higher percentage of African production is not from this species. The answer lies in the nature of the plant itself. In the first place, it is a somewhat delicate tree which responds poorly in a continually hot or dry environment. This restricts it largely to areas of higher elevations. Secondly, unless management techniques are of a high order it does not yield large crops. And, more importantly, it is very susceptible to a number of diseases and insect pests. As a result, smallholders and peasant cultivators can often grow *robusta* types successfully where they might not succeed with the more demanding *arabicas*.

Nearly 75 percent of current African coffee production is from trees of *C. canephora*, the so-called *robusta* coffees of commerce. The dominance of this specie undoubtedly reflects the fact that it is a more vigorous tree, resistant to many of the more serious diseases, does well in the hot and humid or drier regions of the continent where *arabica cannot successfully be grown, is usually higher yielding, and requires less careful management than arabica.*

Perhaps one of the reasons for the greater adaptability of *C. canephora* is that it originated over a wide area encompassing a greater diversity of ecological conditions than was the case with *C. arabica*. The species *C. canephora*, of one variety or another, has been found growing spontaneously in West Africa from Senegal in the north to Angola in the south. Its natural habitat also includes the southern Sudan and Uganda. Also, the fact that it is not self-pollinating, like *arabica*, but, rather, requires cross-pollination, has contributed to a much greater genetic variability which enables it to prosper under a wider range of natural conditions.

Although not well accepted in most world markets for a considerable period of time, *robusta*-type coffees have gained increasing recognition during the past 20 to 30 years. Several factors are responsible for the enhanced demand for *robustas* including increasing world production of soluble coffee, for which they are particularly suitable, and widespread efforts to improve the quality of *robustas* through selective breeding and hybridization, and better preparation for market. However, it remains to be seen whether *robustas* can continue to make inroads in traditionally *arabica* markets in the years ahead.

Major producers of *C. canephora* varieties, in order of importance, are the Ivory Coast, Angola, Uganda, Rep. of Zaire, and the Cameroons. The island of Madagascar, though not strictly speaking a part of Africa, is also a large producer of *robusta*-type coffee.

Still a third species of coffee grown commercially, albeit on a very small scale compared to *C. arabica* and *C.* canephora, is *C. liberica.* It occurs naturally over a considerable region of West Africa, as well as in Sudan. Because of its high resistance to *Hemileia vastatrix* (coffee rust) it was taken to Java in the last century to replace the failing *arabica.* It has also been introduced to the island of Madagascar, the Guianas, Malaya, and the Philippines. A small amount of *liberica* coffee is exported to Europe, primarily to the Scandinavian countries.

The specie possesses a number of good qualities, among them resistance to rust, tolerance of drought and poor soils, and an ability to withstand extreme neglect that would ruin trees of either *C. arabica* or the *robusta* varieties. Nevertheless, because of its poorer cup quality and strong bitter taste, it has not achieved popularity and it probably furnishes at most 1 percent of the world's coffee.

Major producing countries

Despite certain basic similarities Africa's coffee industries have significant differences from country to country with regard to environmental conditions, species or varieties grown, systems of production, and processing and marketing procedures.

Ethiopia

Status of the industry *

To the student of coffee a visit to Ethiopia, home of *Coffee arabica*, is a fascinating experience. Coffee forests, possibly covering as much as 400,000 hectares, still exist mainly in the western and southwestern provinces. A substantial part of this coffee is still unexploited and much of the area has yet to be systematically explored. Throughout most of Kaffa and Illubabor Provinces, for example, the *arabica* coffee tree spreads spontaneously, and readily naturalizes in forest areas ranging from 3,000 feet to slightly over 6,000 feet in altitude.

As far as is known all wild trees occurring in Ethiopia belong to the species *C. arabica.* However, an unusual degree of variability with regard to morphological characteristics has been noted both in wild forest trees and trees under cultivation. In 1964 the Food and Agriculture Organization (FAO) Germplasm Expedition, headed by Dr. F. G. Meyer of the U.S. National Arboretum, Washington, D.C., collected approximately 500 different coffee types in Ethiopia.

The removal from power of Emperor Haile Selassie and the nobility, which occurred last fall, set the stage for the recently announced nationalization of all land. It is not yet known whether the present ruling group intends to give this land to the peasants as small free-holdings or whether some form of "collective farming" will be attempted. The difference is crucial. An independent peasantry, given some technical and financial assistance, could probably initiate the process of modernization which would result in steadily expanding production in the future.

At the present time, perhaps 80 to 85 percent of Ethiopia's coffee production is derived from spontaneous or subspontaneous trees, i.e., trees located in fringe forest areas or replanted forest seedlings. This type of exploitation is generally referred as to forest or semi-plantation. Cultural practices in such areas are extremely rudimentary, consisting largely of some slight reduction in forest shade, thinning out of the coffee trees (where these are too crowded), and harveting. If necessary, one cleaning per year is made just prior to the harvest. Under such conditions yields are very low, probably not over 200 kilograms per hectare, but costs are neglifible.

In the Province of Harar, which produces the highest quality Ethiopian coffee, some small plantations were started toward the end of the 19th century. Such plantings were expanded in the early years of this century and initiated in the neighboring regions of Arussi, Sidamo, and other Provinces. Terracing and irrigation are sometimes seen. Yields, at about 300 kilograms per hectare, are significantly better than the forest zone though still low.

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*Much of the material for this section was obtained during the author's visit to Ethiopia in September October 1969; it has been updated from subsequent reports from the American Embassy, Addis Ababa, trade and other sources. It is believed that the information presented is still valid though the political events of the past year may have resulted in some changes in marketing or Government policies of which we are unaware.

In contrast to most of the West African coffee-producing countries, virtually all of the land in Ethiopia's coffee zones is privately owned. Thus the problems associated with tribal or communal ownership of land are not present here. Nevertheless, serious land tenure problems do exist since a high percentage of Ethiopia's best agricultural lands is owned by absentee landlords, prominent among whom are Government officials and the Church. These farms are generally operated by tenant farmers on a crop-sharing basis. It is customary for the owner to send his representative to the farm at harvesttime to ensure that he gets his full share of the crop which may, in some instances, be as much as three-fourths. Under such a system, there is little incentive for either the owner or the tenant to increase inputs to raise production.

The concentration of ownership in a small group, the system of sharecropping, insecurity of land tenure, and inequitable rents or share arrangements all contribute to the prevailing peasant apathy.

Even the landowner has his problems since in many areas land titles are of doubtful validity and litigation is common. Although the Government has initiated a land reform program implementation has been notoriously weak.

Farms vary in size from small to very large, but an average farm in the coffee zones generally occupies at least 8 to 12 hectares (20 to 30 acres). Only a small part of the farm is planted to coffee, however, and on the smaller farms most land is in food crops, with perhaps 100 or 200 coffee trees planted near the house.

Some 15 to 20 percent of Ethiopia's production comes from plantations; that is, from trees planted from nursery stock and generally from selected seed. Such plantations are generally very small in size. In the late 1950's the first really modern plantations were established. Although there seems to be some interest in plantations and the Government encourages them, their actual number is increasing very slowly. A serious lack of knowledge and experience of modern plantation methods is evident among owners and staff alike. Plantation yields, therefore, though substantially higher than those of the small farmer, are probable not high enough to make the operation very profitable. Some persons also consider plantations too costly and time consuming to establish and prefer alternative investment opportunities. Hence, growth of the plantation system will probably continue to be slow.

Ethiopian coffee is placed in the category "Unwashed Arabicas" under the International Coffee Agreement and about 95 percent of its exports are of unwashed coffees. However, interest in wet processing has increased markedly in recent years, primarily due to high prices received in Europe (principally West Germany). In recent years export of washed coffees amounted to 5,000 to 6,000 metric tons (5 to 7 percent of the total). Many of the modern plantations have wet processing facilities, and the small farmers, more and more, are taking their ripe cherry to regional pulping and washing stations which have been set up by middlemen and buyers. Although this is a healthy trend in terms of the country's economy, prevailing standards of harvesting must be drastically improved (i.e., only ripe cherries) if maximum benefit is to be derived from wet processing. In intrinsic quality of the bean, Ethiopian coffees rank high.

Given the manner in which coffee is grown, harvested, processed, and marketed in Ethiopia, it is not surprising that reliable data are virtually nonexistent. Information regarding production, consumption, and yields is extremely hard to collect in the plantation areas and almost impossible to obtain in the forest regions. Nevertheless, the USDA has developed some data on production, based on the best information available to it. The gradual increase in production noted in the following table is probably due, in large part, to the slow improvement in the country's road network in recent years which has made it possible to market more of the wild coffee, and has also served to bring more of the rural population into the money economy:

In 1,000 bags of 60 kg.

5-year average		
	1960-65	1,490
Annual		
	1965-66	1,525
	1966-67	1,750
	1967-68	1,750
	1968-69	2,045
	1969-70	2,000
	1970-71	2,100
	1971-72	2,150
	1972-73	2,100
	1973-74	1,700 *(drought)*
	1974-75	2,050

Marketing system

Coffee trade in Ethiopia is entirely in private hands. Traditionally coffee from the small producers is sold to agents representing village or small towm merchants. These in turn sell to larger buyers at important regional centers. Following processing, the coffee is then trucked to Addis Ababa for sale to the exporters. Given the large number of middlemen and the average producers lack of knowledge of market conditions, it is likely that few producers receive a fair return for their crop, and that most of the profit is absorbed by the middlemen and exporters. In recent years a number of grower cooperatives have been established with the help of the Coffee Board, and it is possible they may be able to eliminate at least one link in the chain and thus obtain a more favorable return for the grower.

The National Coffee Board (NCB), though it licenses persons operating in all phases of the industry, e.g., truckers, processors, and exporters, does not intervene to establish prices at any point in the operation, nor does it buy or export coffee.

The primary role of the board, since its creation in 1957, has been to take such steps as would result in a continued improvement in the quality of Ethiopian coffee exported to world markets. It has been reasonably successful in attaining this objective.

Until a few years ago Ethiopian coffee was notorious in world markets for its poor quality. Ripe, half-ripe, and green cherries were indiscriminately mixed together before drying resulted in a noxious fermentation. As a result of the activities of the board, considerable progress has been made. The board conducts a preliminary inspection of all coffees in regional centers in the growing areas. Here coffee must reach certain standards before permission is granted to truck it to Addis Ababa. Subsequently, in Addis the coffee is again inspected and certified before an export license is granted. Over the years, standards have been tightened. From 1952-58 grades 1 to 8 (Brazilian system) could be exported; from 1958-61, grades 1-6; and since 1961, grades 1 to 5. There is no present intention to upgrade still further.

Although there are some 50 exporters registered and licensed by the NCB, most of the coffee is exported by the 5 or 6 largest firms. Few of these maintain buying agents in the interior but buy in Addis Ababa from truckers and other middlemen when coffee arrives in the capital city. One large exporter operates a very large modern mill equipped with electronic sorting machines capable of hulling and grading nearly the entire present production of the country. In addition to being optimistic about future growth of production in Ethiopia, he expects to do custom cleaning and grading for other exporters.

With the exception of some 10,000 metric tons a year which move directly from Harar Province to the port of Djibouti, all Ethiopian coffee moves through Addis Ababa en route to the port of exportation.

Government policy

The NCB, and the Ethiopian Government have deliberately refrained from encouraging better cultural practices such as pruning, selected seed, and use of fertilizers, because they are afraid they would be unable to market a significantly larger amount of coffee under present world market conditions. Nevertheless, in the opinion of informed observers a steady increase in production during the next few years can be expected as more roads and the general development process open up new coffee forests to economic exploitation.

In line with their efforts to improve quality the NCB is encouraging a shift from forest to semiplantation and from semiplantation to plantation type of cultivation. It is also promoting the consolidation of farms into economic-sized units. Credit is granted only to those coffee farmers willing to work along modern lines.

The NCB is also stimulating and assisting the transition from unwashed to washed coffee in order to maximize the country's foreign exchange return from its quota. Improved quality will have a significant bearing on Ethiopia's future position in the world coffee market. Achievement of higher quality will increase production costs, but these are so low that a reasonable increase will not affect the country's competitive position.

Although it recognizes that coffee production will continue to increase, the Government is attempting to find new crops which might be encouraged in the coffee zones, and is also seeking ways to divert migratory workers from the northern provinces to areas other than the coffee zones by providing them with more attractive alternative employment. Among possible new crops would be tea. The Government is hopeful of expanding tea production in the southern highlands in regions of heavy rainfall, and at about 6,000 feet elevation.

Research

The first coffee research station in Ethiopia was established in Jimma, in Kaffa Province, in October 1967. The station, which will concentrate on improvement of coffee yields and quality, is financed by the NCB and the FAO Special Fund. Similar stations are to be set up in the other four coffee-producing provinces. The station is in its formative period and it will be many years before it will start providing much useful information to the industry.

The success of any program designed to improve the quality and yield of coffee depends largely on the genetic variability of the plants available to the breeder from which to select. One of the reasons that relatively little progress has been made in coffee breeding in the Western Hemisphere is precisely this lack of variability since all of these trees are the progeny of a very few originial trees from the Netherlands. Hence progress through selection has, of necessity, been very limited. Such genetic advances as have occurred have generally come about through spontaneous mutations or hybridization which have given the plant breeder, and farmer, such new varieties as *caturra* and *mundo novo*.

In Ethiopia, however, may be seen numerous varieties of coffee exhibiting more variation that can be observed in the literally billions of trees of *Coffea arabica* in the rest of the world. Thus, the country is an enormously important source of germ plasm from which to select for yield, quality and aroma, disease resistance, uniform ripening, bean size, and many other characteristics. To be able to take advantage of the situation, however, will require sound basic research carried out over many years by competent scientists and technicians, as well as expansion of extension activities related to coffee. As noted, research in Ethiopia is just beginning.

Production potential and limiting factors

It is almost impossible to estimate the potential for further increase in coffee production in Ethiopia but it is probably enormous. Natural conditions are almost ideal, particularly in the western and southwestern provinces. The country has very large areas of land available for coffee with soils equal to the best on which *arabica* coffee is grown anywhere in the world. Rainfall is regular and abundant and generally well distributed throughout the year. The altitude at which coffee is grown, from 1,500 to 2,000 meters above sea level, is conducive to the production of a high-quality *arabica*, and given greater experience and care in preparation, Ethiopian coffees could compete with the best grown anywhere.

In addition to the tremendous expansion of production which could take place as result of the incorporation into the economy of all of the present coffee forest areas, or massive new plantings, much could be done with the existing exploited acreage. Yields could be stepped up significantly by such simple steps as proper spacing, shade control, pruning, fertilization, and adequate attention to insect and disease problems.

The long-range potential is, therefore, very great. However, what is likely to be the trend of production during the next few years?

Limiting factors are numerous and readily apparent. The country is primitive in the extreme and the still-predominant peasant sector is tied to its traditional pattern of subsistence agriculture and is resistant to change. The Government, as noted, has not been interested in expanding coffee production and, though its attitude may change, it lacks the research and extension capability (to say nothing of finances) to move very rapidly in the direction of modernization and expansion of the coffee sector.

Also, land tenure patterns in the coffee sector, i.e., relatively small farms with many owned by absentee landlords, do not lend themselves to rapid change in operating methods. It should be stated, however, that although this absentee owner/tenant system is socially undesirable and inefficient, it at least offers fewer obstacles to the eventual modernization of the industry than the tribal/communal ownership of land typical of West Africa.

On balance, it would appear that the next few years will witness only a gradual increase in production from Ethiopia, accompanied by a more rapid increase in the percentage of washed coffees exported.

Political events of the past year in Ethiopia could have far-reaching consequences on the agricultural economy of the country, including coffee.

Ivory Coast

Species and varieties

A number of species of the genus *Coffea*, including C. canephora, *C. liberica*, and *C. stenophylla* are native to one region or another of the Ivory Coast. The first commercial plantings in the country, dating from about 1880, were of the *liberica* specie. Subsequently, a closely related specie, C. *abeokutae*, was widely grown. Later these were gradually supplanted, over wide areas, by the *kouillou* variety of C. canephora. However, because of the susceptibility of this latter variety to certain diseases, it is being replaced in turn by high-yielding and disease-resistant clones of a *robusta* variety originating in the Rep. of Zaire.

Status of the industry

Although commercial coffee production dates back to the 19th century, it is only since World War II that the industry has become of major importance. Growth has been particularly rapid since the mid-1950's and the Ivory Coast is now the largest producer of *robusta* and the third largest producer of coffee of all types in the world, after Brazil and Colombia.

Reliable data regarding the area planted to this crop are difficult to obtain, but estimates indicate that as much as 760,000 hectares of land may be devoted to coffee cultivation; this is 2 percent of total land area. One reason for the difficulty in making more accurate estimates is that coffee is frequently grown in mixed stands with cocoa trees. Perhaps as much as one-fifth of the area in coffee consists of trees over 25 years old, of very low productivity.

Although the area in coffee seems small in relation to the total area of the country, the appropriate climate and rainfall required for the crop are to be found only in the southern part of the country below the eighth parallel. Here it must compete for space with cocoa, bananas, oil and coconut palms, pineapples, most staple food crops, truck gardens, and fruits. Much of this area is also still forested. Taking the foregoing into account, it has been estimated that coffee occupies about 38 percent of the land devoted to crops other than food staples. This gives, perhaps, a better indication of its importance to the economy. Although estimates for both area and production vary widely depending on the source, the very rapid expansion of the industry in the past 30 years is evident from the following table, based largely on USDA estimates of production. It is equally apparent that production has leveled off during the past decade, with year-to-year variations depending on weather:

In 1,000 bags of 60 kg.

1940-41	265
1945-46	585
1950-51	783
1955-56	1.975
1960-61	3.200
1965-66	4.550
1970-71	4.000
1974-75	4.000

Coffee is produced almost entirely by smallholders whose plots range from 2 to 5 hectares in size. Customarily, a portion of the land is devoted to food crops (cassava, yams, etc.) and on the remainder coffee and/or cocoa trees are planted. Labor is largely provided by the family—generally the women and children—and the tendency is to give first priority to the food crops. As a natural result, the coffee trees tend to be neglected, unpruned, haphazardly spaced, and in poor condition. Yields are very low, probably no more than 300 to 350 kilograms of clean coffee per hectare on the average. In certain areas of the country migrant labor (from the northern regions or Upper Volta) is employed on a sharecrop basis.

There are a very few modern, fairly large plantations. On these farms the coffee is generally well cared for, pruned, fertilized, and obviously more productive. However, no more than 1 to 2 percent of the total production of the country comes from such plantations and the proportion is not increasing.

Coffee processing usually takes place in the general area where it is grown. The small farmers dry their coffee on the ground, then take it to villages or some nearby area where small hulling machines are generally available to hull the coffee. Following this the coffee is handpicked generally by women and children to remove black and defective beans and the coffee is ready for sale to agents representing the exporters in Abidjan. There are also modern processing facilities in Abidjan where coffee may be cleaned or sorted before export, and separated by quality grade.

A new processing mill was put into operation in the Tombroko area in 1973, with a capacity of about 40,000 tons of cherry coffee per season. The objective is to reduce the amount of farm labor required, thus making coffee production more attractive to the smallholders, as well as to turn out a higher quality and more uniform product. If the plant is successful, the Government plans to build a second such mill, probably in 1975.

In addition, soluble (instant) coffee is produced in a plant near Abidjan. In 1974 a program to expand capacity from 4,000 to 6,000 metric tons per year was begun. Part of the production is consumed locally, with most of the balance going to other African countries.

In line with the Government's policy to increase local participation in all phases of the industry it has encouraged the formation of producer cooperatives which will sell directly to the exporters, thus eliminating the network of buyers, many of whom are expatriates.

Marketing system and prices

The local purchase and export of coffee are controlled and regulated by the Caisse de Stabilisation des Prix, which fixes the price to be paid to the producer, the amount allowable for transportation to the port of shipment, and the profit margins allowed the purchasing agents and exporters. The Caisse also sets quality standards and the minimum export price. The Caisse generally does not assume ownership of the coffee or ship it abroad, except in the case of surplus stocks, for which it assumes responsibility from the exporters after they have held the coffee for a prescribed period of time.

Government policy

The Ivory Coast has been a member of both the 1962 and 1968 International Coffee Agreements since their inception. Following entry into effect of the 1962 Agreement and faced with production in excess of its quota, the Ivory Coast Government took steps to prohibit new plantings of coffee, in order to bring about a better balance between production and permissable exports. By 1968, however, the Government became convinced that a modification of this policy was called for. The feelings was that continued prohibition of new plantings would result in a gradual decline in production as yields of aging trees fell off sharply under the prevailing primitive cultural practices. In the 1971-75 Development Plan (published in 1968) a program was announced designed to increase production from the average of the late 1960's of about 3.8 million bags, to 4.4 million bags by 1975, and 6 million bags by 1980. The increase was to be achieved through a long-term program of replanting with new varieties and a shift to more intensive cultural methods. Although official policy in this regard does not appear to have changed, there are indications that the program may not achieve the degree of success hoped for because of the country's small-farm production pattern and its intrinsic inflexibilities.

Research

The IFCC (Institut Francaise de Recherches de Cafe et de Cacao) operates a number of research stations doing work on coffee and other crops. Research generally centers around variety trials, fertilizer trials, and disease control. Since *Coffea canephora* (*robusta*) is self-sterile, there is extreme variation between trees in yields, bean size, and other characterisitcs, and trees do not breed true from seed. Accordingly, a great deal of work has been done to develop and select outstanding clones which can be used as "mother" trees. These would then be propagated vegetatively for distribution to farmers as rooted cuttings. Although cost of these cuttings is two to three times that of seedlings, this would be compensated for by the precocity of the plants and their higher yields.

In early 1974 the institute announced that it had successfully stabilized a cross between *arabica* and *robusta* and that a trial planting of 100 hectares had been made in the southwest area near Zagne. Should such a cross combine the resistance and yield characteristics of *robusta* with the quality of *arabica* it could conceivably be of considerable significance to the future of coffee in Africa.

Production potential and limiting factors

The small-farm peasant-type culture which characterizes the coffee industry in the Ivory Coast has certain advantages. The very low production costs (because of minimum labor and other input), the insulation of the producer from price fluctuation on the world market, and the combination of cash crops with food production, all tend to render the farmer relatively immune from temporary economic recessions. Hence, production of coffee tends to continue regardless of price on the world market.

At the same time, however, this pattern of production has serious disadvantages in that it lacks the flexibility and dynamism to increase production rapidly in response to a changed situation or new Government policy, nor can it effectively make use of new complex production techniques.

Although there is increasing awareness of the fact that this traditional pattern of land tenure and production poses serious obstacles to the modernization of the coffee industry, most observers are of the opinion that changes in the system will come about only slowly and over a considerable period of time.

Given this system, production increases in the past were achieved by the simple expedient of planting additional acreage. However, although adequate reserves of suitable lands still exist it is doubtful that this traditional method of expanding coffee production can be successfully continued. The limiting factor appears to be labor supply. Each year rural migration to the cities gains momentum, while the expansion of crops such as cocoa, oil palm, rubber, bananas, and pineapples makes additional demands on both land and labor.

Consideration has been given by the Government to a program for expanding production through a combination of new varieties and improved care. Such a program, though not requiring additional lands, would run into the same problem of potential labor shortage. It has been estimated that under present conditions the average farmer produces from 300 to 350 kilograms per hectare of coffee with only 40 man-days of work. Present varieties are thought to have a production potential of up to 800 kgs per hectare, but to achieve this would require a labor input of 200 man-days per hectare, thus yielding even less per man-day than the present primitive culture. To achieve a positive step forward, therefore, would require a complete modification of the industry, involving new varieties, a labor input of 250 man-days per hectare, and production of at least 2,000 kilograms per hectare.

It would appear therefore, that while productive efficiency could be enhanced by new varieties and more intensive cultivation, labor shortages might force a reduction in acreage, thus restraining overall production increases. In any event, a complete modernization of the industry, such as is envisaged in the Government's plan, probably could not be achieved in less than 15 to 20 years.

Angola

Angola differs from many of the other coffee-producing countries of West Africa in that most of the country is a rolling plateau ranging from 1,000 to 2,000 meters above sea level, and sloping down to a narrow coastal plain. The most northerly portion of the coffee area, near the boundary with the Republic of Zaire, is mountainous in character covered by humid forest. The central and southern portions of the coffee zone are predominantly subhumid, gently rolling savanna.

Rainfall in these areas is moderate, declining from north to south. Soils are generally red and yellow latosols with considerable natural fertility.

Many wild *Coffea* species are to be found in the forests of western Angola, north of the 12th parallel. Nevertheless, all commercial production is derived from introduced *robusta* and *arabica* varieties.

Status of the industry

Angola is the second largest coffee producer in Africa (after the Ivory Coast) and the fourth or fifth largest in the world (following Brazil, Colombia, and the Ivory Coast and alternating with Mexico).

Although some coffee has been produced and exported since the 19th century, (in the beginning it was collected from wild trees) it is only since World War II that exports from Angola have attained sizable proportions as production has gone up; reaching 3 million bags by the mid-1960's:

In 1,000 bags of 60 kg. and 5-yr. avg.

1929-33	180
1934-38	278
1946-50	760
1951-55	959
1956-60	1,367
1961-65	2,910
1966-70	3,180
1971-75	3,280

The rate of increase during the past decade has been less rapid than before. Production now appears to have stabilized at between 3.2 million and 3.5 million bags per year.

Acreage in coffee has been estimated in recent years at about 525,000 hectares, of which approximately 98 percent was planted to *robusta* and 2 percent to *arabica*. Average yields are quite stable at between 350 and 400 kilograms per hectare.

The pattern of production in Angola differs very significantly from that of the Ivory Coast, or most other African countries, in that the bulk of the crop comes from medium- and large-sized farms, i.e., farms of over 100 hectares in extent. Some 75 percent of total coffee production is produced by approximately 2,200 estates covering about 385,000 hectares. Fifty thousand small farms, totaling 140,000 hectares, produce the remainder. Most of the larger farms are owned by Europeans (mainly Portuguese), though there are a few African farms in this category. The smaller farms, ranging from plots of a few hundred trees to fields of 100 hectares, are generally owned by African villagers. These farms, though very small by comparison with the predominantly European-owned farms, are generally somewhat larger than is the case in the

Ivory Coast or other West African countries. Medium- and large-sized plantations are almost exclusively dedicated to coffee, while the smallholdings are diversified, producing also foodstuffs mainly for family consumption.

Both the number of plantings and the coffee area increased until about 1963, with major plantings occurring in the late 1950's and early 1960's. However, in response to low world prices for coffee and the constraints imposed by the International Coffee Agreement of 1962, of which Angola was a member, the Government, acting through the Angolan Coffee Institute, moved to limit new coffee plantings after 1962. In 1966, the policy was made even stronger as the Government flatly prohibited all new plantings other than those of less than 1,000 trees per family undertaken by small farmers. Despite these strong measures, large carryover stocks have accumulated and remain a problem to this day.

The Ambriz region, in the north, is the most important in terms of production. Most of the smallholdings are in this area, with the European properties generally in the small to medium-sized category. Given the importance of smallholdings in this area, and the fact that it is a region of rather sparse population, labor shortages are among the more serious problems faced by the larger plantations. Most have been forced to bring labor from other parts of Angola where population density is greater.

Generally laborers are brought to the Ambriz region on a 1-year contract basis. The plantation provides food and housing and pays about one-fourth of the agreed wage to the worker each month. The remaining three-fourths is paid to the worker when he returns to his village after his 1-year contract is completed.

Although the Amboim area, farther to the south, produces far less coffee than the area around Carmona (Ambriz), it is here that the larger plantations are to be found. Some rank with the largest coffee plantations to be found anywhere in the world, producing from 2,000 to 6,000 metric tons each. One, the Fazenda "Boa Estrada," owned by the Companhia Angolana de Agricultura (CADA), has produced as much as 12,000 metric tons. Since this part of Angola is more densely populated the plantations have not suffered from a shortage of labor.

Coffee was first planted in Angola in the more mountainous areas of the country at altitudes ranging from 500 to about 1,200 meters above sea level, and under forest shade. The original forest was simply thinned out somewhat to accommodate the coffee trees. More recently, many plantings have been established in the so-called savanna areas of the country. In these areas, originally treeless, *arabica* coffee is generally planted in the sun while *robusta* coffee is lightly shaded. Interestingly enough, this is the reverse of Western Hemisphere experience where it is believed that *robusta* is more tolerant of sun than *arabica*.

The more level land and the use of artificially planted shade, with the shade trees neatly planted in the same row as the coffee, have facilitated mechanized cultivation, and these savanna properties are often more efficient and more productive than those in the mountains.

Not surprisingly, in view of the larger scale of operations and more sophisticated management, average yields per hectare on the larger farms in Angola are substantially higher than in other West African countries. It is believed that production on the larger farms averages between 500 and 600 kilograms per hectare. The small African-owned village farms produce much less, probably not more than 300 kgs/hectare. These lower yields result from inferior care, excessive shade, and neglect of pruning.

There is still a considerable potential for expansion of *robusta* production, in terms of suitable lands. Possibilities for increased *arabica* production are more limited.

Government policy

Responsibility for the implementation of policy and control over production and marketing of coffee in Angola is vested in the Angolan Coffee Institute, a quasi-official organization whose board includes representatives of all sectors of the coffee economy.

The institute maintains extensive laboratories in Luanda where coffee samples sent by exporters are analyzed and classified to ensure that they meet the minimum required export standards. The institute also maintains large warehouses where coffee is stored, following classification, until it can be shipped.

The institute establishes, each year, a minimum guaranteed price at which it will purchase all coffee offered to it by the producers. In practice, however, almost all sales are effected directly by the producers to an exporter, or his agent, at prices higher than the minimum. Internal prices, in other words, are not fixed as they are in other West African countries, but vary in accordance with the world price and competition between exporters. All exporters must be licensed by the institute.

Sales are generally on an f.o.b. basis; occasionally c.i.f. sales are effected. There are usually no shipments on consignment.

Research

The Angolan Coffee Institute operates three main coffee research centers at Carmona, Ganda, and Gabela. In addition, the instituto de Investigaciones Agronomicas do Angola, in Salazar, does a good deal of research on coffee and other crops.

In addition to the usual variety and fertilizer trials, a substantial effort has been made on disease control. The station in the north, near Carmona, has attempted to find varieties or cultivars resistant to the rust disease *Hemilea vastatrix*, which appeared in this area for the first time in the late 1960's. This disease kills *arabica* trees almost without exception, but most *robusta* types show immunity, though in varying degrees.

The coffee region near Gabela, farther south, has been suffering from a disease known locally as morte subita (sudden death). Trees affected by this disease suddenly wilt and die. In contrast to *Hemilea*, it attacks *robusta* coffee almost exclusively. The seriousness of the problem may be gaged from the fact that about 10 million trees were killed in this area in the space of 4 years. The largest plantation here, for example, lost over 3,000 hectares of coffee out of a total of 17,000 in 4 years.

One of the most serious aspects of the disease is that thus far the research people have been unable to determine either its cause or how to control it. One line of investigation has been the grafting of *robusta* scions on *arabica* rootstocks to see if that will provide at least a partial solution.

The Coffee Institute also engages in extension work and has greatly expanded this activity in recent years. The institute is particularly active in the African villages in the northern coffee region near Carmona. Here they are helping the smallholders construct drying patios, obtain small hulling machines, etc. The institute also helps the small farmer with crops such as corn, soybeans, and cassava.

Production potential and limiting factors

Angola has the potential to increase coffee production substantially in the future. Although reserves of the type of forest lands originally planted are limited, plantings in the savanna areas have demonstrated that coffee can be produced very successfully in these regions.

Angola also has the advantage, vis-a-vis many African coffee-producing countries, that apart from African reserves around the villages the land belongs to the Government or is privately owned by individuals. This makes possible the purchase and sale of land held in fee simple, and the formation of medium-sized and large plantations. These larger holdings not only enjoy economies of scale but generally have much more efficient and progressive management.

Although cultural practices on these larger plantations are generally good, there is surprisingly little use of fertilizers. This is probably due to the fact that with current low labor costs and minimum problems with *robusta* coffee, profits are high and the planters are under no pressure to change their methods. In some areas, too, shade is a bit too dense, which inhibits response to fertilization.

There are some limiting factors which may hold down future production increases. In the Ambriz area future availability of labor seems to be the critical factor. In Amboim, much of the area is marginal in terms of rainfall.

On balance, it may be anticipated that production during the next few years will increase only slowly, despite the large potential in terms of new lands and the scope for better yields per acre.

Uganda

The prevailing landscape of Uganda is a mixture of rolling land, open savanna, forests, and swamps. On the west it is bounded by the massive Ruwenzori Range and by Lakes Edward and Albert. Kenya lies to the east with Lake Victoria, to the south, being shared with Tanzania and Kenya. Most of the area of the country is at over 600 meters altitude while the principal coffee area is located at more than 1,000 meters above sea-level. The climate, therefore, is subtropical in nature. Open wooded savanna is the most typical type of vegetation.

Soils in the coffee area are red and yellow latosols or weathered volcanic in origin and are of better than average fertility. Rainfall varies from 40 to 60 inches per year, with adequate distribution.

Both *coffea canephora* (*robusta*) and *coffea arabica* (var. *tipica*) are produced, with the former accounting for about 85 percent of total production.

Status of the industry

Coffee in either pure stands or mixed with other crops occupies approximately 750,000 acres (304,000 hectares) of some of the best agricultural land in Uganda. *Coffea canephora* (*robusta*) accounts for over 700,000 acres of this, with *arabica* acreage totaling about 50,000 acres.

Almost all of the *robusta* coffee is grown within a distance of 75 miles from Kampala, the capital city, in an area running inland from the shores of Lake Victoria. About 85 percent of the crop comes from the Province of Buganda alone, where an estimated 87 percent of all landholders cultivate some coffee.

The majority of the *arabica* acreage is to be found in the eastern region around Mt. Elgon and in higher areas of the western region.

Although in the early days of coffee production in Uganda—the 1920's and 1930's—it was largely an estate crop, there are now only a handful of plantations, with almost all production coming from over half a million small farms. More than half of these farms, covering an estimated 78 percent of the total coffee area, are less than 2 acres in size.

Only about one-third of the coffee acreage occurs in pure stands. The rest is commonly interplanted with plantains, other fruits, manioc, peanuts, and other food crops.

In view of the large number of very small farms, and the fact that the majority of these are not devoted exclusively to coffee, it is not surprising that the general standard of management is comparatively low. Cultural practices are often rudimentary, labor input is generally limited to that available from the farmer and his family, and the use of fertilizers or other chemicals is negligible.

The most noticeable problems affecting yields are the almost total absence of pruning, failure to keep coffee weeded, and the very wide spacing between trees. Thus, although individual trees in some cases are fairly productive, per hectare yields are low. Nevertheless, the natural fertility of the soil is such that yields probably average close to 550 kilograms of green coffee per hectare. This compares very favorably with the yields of perhaps 350 kilograms per hectare achieved in the Ivory Coast.

Coffee production has increased rapidly during the past 30 years, particularly in the period from 1950 to 1963. Since that time production has stabilized:

	1,000 bags in 60 kg.
Annual:	
1940	236
1950	402
1959	1,614
5-year average:	
1960-64	2,416
1965-69	2,887
1970-74	2,980

Processing and marketing

As might be expected, small farm processing tends to be primitive. Coffee is generally dried on mats or at times simply on the ground. The dried cherries called Kiboka—are then delivered to one of the some 200 small so-called factories or curing works. In the case of small farmers who are members of a cooperative society, the coffee would go to one of the factories owned by the society or a union of cooperatives. In the case of an independent small producer, his coffee would be processed at one of the independently owned factories, which constitute all but a very few of the 200 factories in operation. Small factories of this type undertake only hulling and preliminary grading.

Some mills are equipped to handle wet processing, i.e., pulping, fermenting, and washing coffee. Production and export of washed coffee increased rapidly during the 1960's and in 1968-69 reached approximately 47,000 metric tons, or more than 25 percent of total *robusta* production. In addition, most of the 15,000 to 20,000 metric tons of *arabica* coffee produced annually is washed.

The Uganda Coffee Marketing Board, an official body functioning under the Ministry of Agriculture, is authorized under the Coffee Marketing Act of 1969 to undertake a variety of activities in the coffee sector including quality control, price stabilization, storage, processing, purchase, and export of coffee. It operates a modern processing plant in Kampala, primarily for grading and classifying the hulled coffees received from the private and cooperative society factories located around the country.

The processing plants, located in the coffee areas, purchase coffee from the growers. However, after milling all coffee must be consigned to the Coffee Marketing Board in Kampala, which, for the past few years, has been the sole exporter of coffee from Uganda.

Government policy

The major thrust of Government coffee policy in the late 1960's was promotion of the grower cooperative movement. The objective was to hasten the day when all coffee in Uganda would be grown and processed by cooperative societies. Although a large number of cooperatives were established, they had only limited success. The main problems were inadequate capitalization and lack of experienced managerial personnel. By 1969 or 1970 it had become apparent that unless Government financing on a substantial scale were to be provided, it was unlikely that the grower cooperatives would be able to take over control of the processing industry from the private sector.

The Government, a few years ago, announced a policy of encouraging expansion of the *arabica* sector at the expense of cutbacks in *robusta* acreage elsewhere in the country. However, there is little evidence of increased farmer interest in *arabica* which is more difficult to manage, has more disease problems, and requires a fairly high level of technical competence.

Due to the unsettled conditions that have prevailed in recent years, up-to-date information is hard to obtain. It is believed that no significant changes in Government policy have occurred.

Production potential and limiting factors

Uganda has the necessary lands to expand *robusta* production substantially. Very significant increases could be obtained through improvement of such simple cultural practices as weeding, pruning, and mulching. The use of more intensive methods, including spraying for disease control, irrigation, and fertilization could bring still further increases in production, which might be economic under certain circumstances.

Suitable lands, at 5,000 feet elevation or above, are also available to perhaps double the present production of *arabica.*

Despite this potential, however, it is believed that production will increase only moderately in the next few years. Increasing production by the more efficient farmers will probably do little more than compensate for the withdrawal of those marginal farmers for whom increased production of foodstuffs seems more attractive.

Zaire

The Republic of Zaire is one of the largest countries in Africa, covering an area of approximately 1.4 million square miles. More than one-third of this consists of the central basin drained by the Congo River. To the east, the basin is bordered by mountain ranges running north and south, which provide the watershed between the Nile and the Congo drainage systems. The snow-capped Ruwenzori Range, a series of lakes (Tanganyika, Kivu, Edward, and Albert) and alternating plains make the landscape one of spectacular grandeur.

One-third of the country approximately is covered by tropical rain forest, with the remainder consisting of wooded savanna and open grasslands.

Efforts to produce coffee on a commercial basis began as early as the 1880's. However, these attempts were not successful since neither the variety planted—*Coffea liberica*—nor the areas selected were suitable. Other species were then tried and by 1900 some 2,000 hectares of *robusta* were in production.

For the past several decades both *robusta* and *arabica* have been produced commercially.

Robusta

The tropical rain forest of Zaire is the home of numerous wild species of coffee, generally closely related to *Coffea canephora*. Despite this abundance of local species, presumably well adapted to the environment, the first commercial estates were planted with seeds brought from the Netherlands East Indies and Ceylon.

From 1935 on, following the creation in 1934 of the Institut National pour l'Etude Agronomique da Congo Belge (INEAC), virtually all plantings, both estate and smallholding, were effected with seed provided by INEAC research stations. Improved clonal material became available in the 1950's from polyclonal fields maintained by INEAC at Yangambi. A large number of different species, subspecies, and varieties were kept at Yangambi, and the material distributed resulted from selections within local or imported progenies and crosses between them.

Robusta is grown in widely scattered areas of northern Zaire in the rain forest belt, and at elevations of up to about 2,500 feet above sea level. The most important producing area for this type of coffee is the Province of Haut-Zaire, with the Provinces of Equateur and North-Kivu also centers of major importance.

Status of the Industry.—Despite the fact that coffee is indigenous to the Republic of Zaire and that commercial plantings had been undertaken as early as the 19th century, it was not until after World War II that rapid expansion of the industry occurred. A number of factors were responsible for this increased interest in coffee, including the relatively favorable world price for coffee from 1949 on, the increasing world production of soluble coffee (for which *robusta* is particularly suitable), and the encouragement of production by the then "mother" country, Belgium, for the purpose of earning badly needed dollars in world export markets:

Year	Estates	Smallholdings	Total
	1,000 ha.	*1,000 ha.*	*1,000 ha.*
1950......	45.3	3.8	49.1
1955......	75.0	13.0	88.0
1959......	135.0	43.0	178.0

Expansion stopped abruptly following independence from Belgium in June 1960. In fact, during the several years of political instability which followed, many European plantations were abandoned and the land reverted to forest. By 1969, it was estimated that *robusta* acreage amounted to no more than 140,000 hectares. There has been little change since that date.

Production, which had reached a high of over 90,000 metric tons in 1959, also declined sharply after independence. By 1965-66 it amounted to only about 30,000 metric tons. Following that time, a gradual recovery occurred, succeeded in the past couple of years by a new fall-off in production following nationalization of most coffee production:

	Metric tons
1956-66	29,800
1966-67	46,700
1967-68	47,500
1968-69	63,664
1969-70	66,630
1970-71	58,500
1971-72	64,921
1972-73	67,500
1973-74	57,000

Arabica

Arabica coffee production in Zaire is confined to the higher altitude areas of the country west of Lakes Tanganyika, Kivu, Edward, and Albert. Although there are several indigenous coffee species in the area, none are cultivated. All of the commercial production comes from introduced cultivars and varieties.

Status of the industry.—As in the case of *robusta*, both the area devoted to *arabica* and the total production increased rapidly in the decade of the 1950's. By 1960, there were 20,000 hectares planted, of which 14,000 were in small estates averaging 50 hectares each. The remainder represented several thousands of smallholders. Soils in this eastern highland area, particularly those around Lake Kivu, are volcanic in origin and some are highly fertile. A characteristic of the region, however, is the pronounced local variability of rainfall, sunlight exposures, and soil conditions; thus, it is unwise to generalize.

Following independence, production of *arabica* coffee, which had reached 12,000 metric tons by 1959, dropped to only 6,500 metric tons in 1967-68. Since that time, it recovered to about 12,000 metric tons in 1973-74.

Production potential and limiting factors

The coffee industry has been subjected to unusual stress in the approximately 15 years since independence. First came a period of political instability and general unrest lasting for several years. From 1967 on, increased stability and calm led to a gradual recuperation in production. However, in mid-1972 the Government, by law, dissolved a number of official agencies dealing with coffee, created a single new agency denominated the Office National du Cafe (ONC), and gave it control over the cultivation of coffee, including its commercialization, sale, and exportation.

Subsequently, in December 1973, the Government decreed that all foreign-owned plantations, ranches, and farms would revert to Zairians. The combination of the creation of the ONC and the takeover of foreign-owned farms effectively places the entire industry, including the transport and processing of coffee, in local hands. While it is difficult to predict the long-term consequences the short-term effects are likely to be adverse.

Federal Republic of Cameroon

The Federal Republic of Cameroon consists of a former British colony in the western part of the country, bordering Nigeria, and a larger, formerly French portion, to the east. Together they have some 6 million population. Topographically, there is an extensive flat coastal plain extending inland for over 100 miles. The terrain then rises to a plateau region ranging from 500 to 1,000 meters in elevation. In the western section of the country there are highlands ranging from 1,000 up to 2,700 meters above sea level. *Robusta* coffee is largely produced in the eastern region from near the coast up to 1,100 meters. *Arabica* coffee is produced mainly in the western region at altitudes between 1,200 and 1,800 meters.

Soils in the *arabica* area are derived from basalts or volcanic ash of moderate to good fertility. In the *robusta* areas, red and yellow latosals prevail with substantial clay content in the deeper layers.

Status of the industry

Although both *Coffea canephora* (*robusta*) and *C. arabica* were introduced in the late 1920's, major expansion of the industry did not take place until after World War II. By 1954 there were about 70,000 hectares under coffee. At the present time, this has increased to approximately 175,000 hectares.

The Cameroon is a medium-sized producer of coffee, in world terms, with average production in recent years of 1.2 million to 1.5 million bags of 60 kilograms each. The country is unusual in that it produces both *arabica* and *robusta* coffees, with the former accounting for about one-third and the latter two-thirds of the total production.

Production for the past 10 years has been steady:

In 1,000 bags of 60 kg.

1965-66	1,200
1966-67	1,000
1967-68	1,100
1968-69	1,100
1969-70	1,200
1970-71	1,150
1972-73	1,440
1973-74	1,500
1974-75	1,500

Most of the large-scale plantings took place in the late 1950's and early 1960's. Very little planting has occurred since 1962. As a result, production increased sharply in the decade from 1955 to 1965 but has been essentially stable since then.

For a few years—from 1968 to 1972—there was a small but consistent rise in *arabica* production, at least partially as a result of increased fertilization. The West German Government, as part of a bilateral aid agreement, provided fertilizer at a subsidized price during these years. This has now been curtailed.

In common with other West African countries, coffee in the Cameroon is essentially a small farm operation, with some 95 percent of the approximately 175,000 hectares in coffee being held by peasant farmers. The average size of the smallholdings is 3 hectares, and that of the estates, which account for the remaining total area, slightly less than 100 hectares. The estates are gradually decreasing in number. Overall yields probably average about 450 kilograms of clean export coffee per hectare. Yields of *robusta* are somewhat higher, on average, than *arabica*.

Government policy

The regulation and control of marketing and producer prices are handled in a manner very similar to that in the Ivory Coast and the other Franc Zone countries in Africa. Prior to the 1966-67 season minimum prices were established separately for east and west Cameroon. Since that year, the minimum price to the producer has been uniform throughout the country.

The Government over the years has given considerable encouragement to the formation of grower cooperatives. These have been of particular importance in west Cameroon where most of the *arabica* coffee is produced.

The coffee sector also benefited from the significant amount of foreign aid assistance obtained since independence. The European Development Fund, for example, was prominent in channeling approximately $140 million in EEC-sponsored aid to the Cameroon in the period 1964 through 1973. A portion of this aid was used to provide subsidized fertilizer to the coffee sector. It appears that the bulk of the fertilizer was utilized by the *arabica* growers. The fund also helped finance research into coffee physiology and pest and disease control, as well as investment in the processing and warehousing of coffee.

Production potential and limiting factors

The prospects for future increases in coffee production in the Federal Republic of Cameroon do not differ significantly from those of the Ivory Coast. In brief, the industry is of the same small farmer type already described, with the advantages and disadvantages of such a pattern of production.

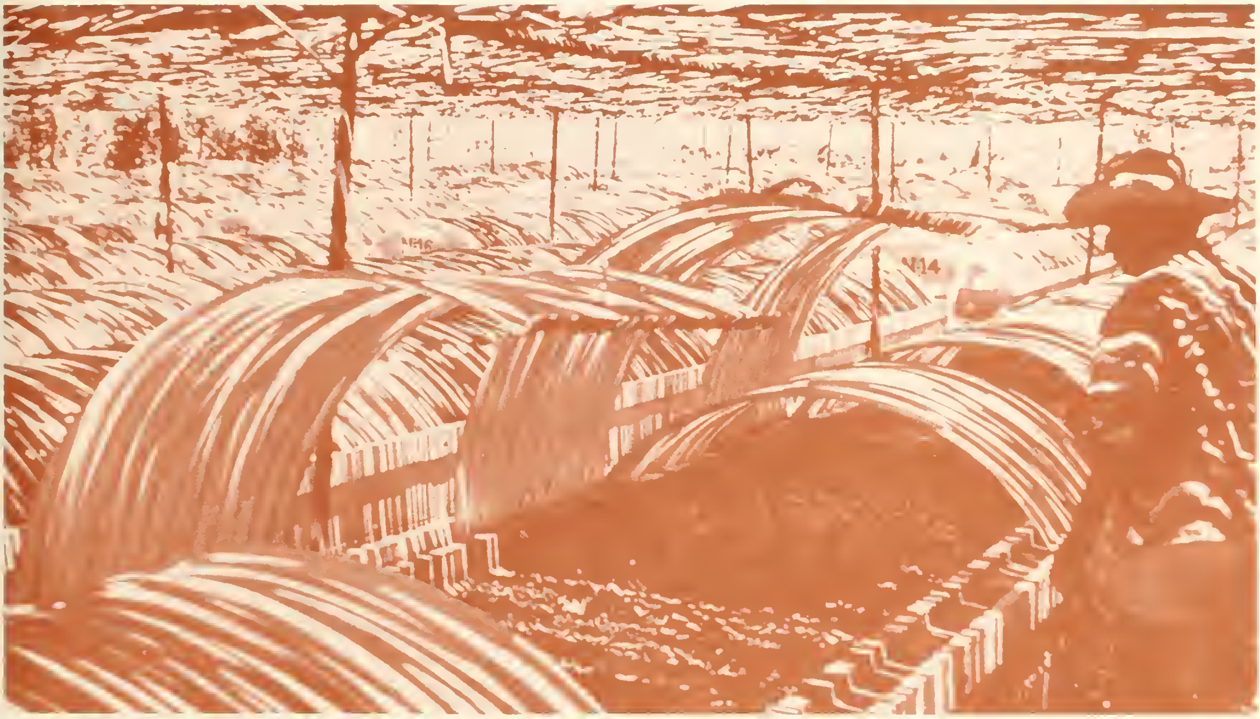
On the plus side, as compared with the Ivory Coast, for example, one might note that the price paid the producer has often been slightly higher (providing more incentive to the farmer); farmers know more about fertilizers; and the country has fairly successful cooperatives, especially in the *arabica* coffee sector.

Above, young coffee in Uganda; coffee occupies some of the country's best land. Below, modern coffee processing plant on a Kenya estate; estate production is going down.

Above, sun drying coffee on a big estate in Kenya; the coffee is spread on burlap. Below, sorting and bagging coffee on a plantation in Madagascar.

Above, young woman hand-sorts coffee in an Ethiopian mill. Left, grower weighs coffee for sale in Ethiopia; most of the country's coffee is sold in small lots, harvested from fringe forest areas

Below, rooting leaf cuttings on an experiment station in Madagascar. The covers can be raised or lowered to control the heat and humidity.



Coffee production in the next few years will probably remain at about present levels or increase at a very moderate rate.

Madagascar

Madagascar is one of the largest islands in the world, approximately 1,400 miles in length and varying from 250 to 350 miles in width. Much of the island consists of an elongated plateau averaging about 5,000 feet above sea level, with low coastal plains on both east and west.

The island is the natural habitat of many wild species of *Coffea*, including several that are notable in that they lack caffeine. However, none of these species are cultivated commercially. The first cultivated coffee came from the island La Reunion but failed to become established in the lowlands because of attacks of coffee rust (*Hemileia* vastatrix). It was replaced by *C. liberica* and *C. congensis*, which also failed; the former because of poor quality, the latter because of poor yields. Around 1900, *C. canephora* robusta seed was imported, mainly of two types: *kouilou*, from the Ivory Coast, and the Congo *robusta* variety. The difference in bean size is striking, with the *kouilou* variety producing a very small seed, giving perhaps 6,000 to 7,000 seeds to the kilogram. At the present time perhaps three-fourths of the exports are still of the *kouilou* variety, though the trend is in favor of its replacement by clonal trees of *robusta*.

The eastern slopes of the island, where the bulk of the *robusta*-type coffee is produced, are steeper than the western slopes and receive considerably more rainfall. Although coffee is to be found along several hundred miles of the east coast, the growing areas are, in fact, disconnected and occupy only the river valleys and gentle slopes. Much of the land is too steep, and the virtual absence of access roads from the coast inland limits the usable areas. *Arabica* is confined to small sections in the central and northern highlands.

Status of the industry

At the present time, coffee occupies about 200,000 hectares, of which 95 percent is under *robusta* and 5 percent *arabica*. No more than 5 or 6 percent of Madagascar's production comes from estates. The rest is produced by some 300,000 to 400,000 peasants, owning on the average no more than 200 trees each. Many farmers have fewer than 100 coffee trees.

The average peasant farm is very small, and generally produces a variety of crops. Malagasy farmers, for example, have a compulsion to plant rice, and one sees this crop throughout the island even in the most unlikely places. In addition, almost all have at leas one or two head of the indigenous zebu-type cattle. The zebu is an integral part of the Malagasy culture and has a semireligious status among most tribes. The need to provide grazing areas for these animals is therefore a necessity for even the smallest farmer. The result is that coffee is viewed essentially as a backyard fruit crop, and very few farmers have over 200 trees. Many have only 50 to 60 trees planted around their houses.

Under these circumstances it is natural that modern cultural practices simply do not exist. The trees are planted, rather haphazardly, and then not touched again until time to harvest the crop. Yields are very low, probably not exceeding 250 kilograms per hectare. In fact, it is only the inherent high-yielding characteristics of *robusta* coffee and its resistance to disease and insects that enables the industry to survive at all. Production costs for the peasant farmer are, of course, virtually nil in the sense that no hired labor is employed, nor are there any inputs of fertilizer or other chemicals.

There are a few states, producing perhaps 5 to 6 percent of the country's total crop. Cultural practices are far superior to those employed by small farmers, and yields are correspondingly higher. However, costs are fairly high; hence, a yield of 700 kilograms per hectare is needed to break even. A few of the large well-run estates average between 1,000 and 2,000 kilograms per hectare. All in all, however, unless returns to the producer are substantially increased, estate production will probably stabilize or decline gradually during the next few years.

Nevertheless coffe has been an important item in the country's economy for many decades. By the mid-1930's, production reached an average level of over 500,000 bags of 60 kilograms each. Acreage devoted to coffee subsequently increased further with the major expansion occurring in the early 1950's. Plantings continued to grow, but at a slower rate, until the mid-1960's. Since that time production has leveled off, and so has acreage:

In 1,000 bags of 60 kg.

1950-51	572	1968-69	900
1961-62	800	1969-70	830
1962-63	1,000	1970-71	1,300
1963-64	735	1971-72	965
1964-65	1,050	1972-73	1,000
1965-66	825	1973-74	1,000
1966-67	865	1974-75	1,100
1967-68	1,100		

An unusual feature affecting the coffee industry is the frequency of devastating hurricanes which periodically strike the eastern coast of Madagascar.

Marketing system

The local purchase and export of coffee are controlled and regulated by the Caisse de Stabilisation des Prix in a manner similar to that which prevails in the Ivory Coast. That is, the Caisse establishes the price to be paid the producer, the profit margin of the exporter, and the expenses allowable for freight, handling, agents commissions, processing, and so forth.

Coffee is purchased from the farmers in dried cherry form by agents representing the exporters. Processing is done by the exporters in mills generally located in the port cities.

Exporters are licensed by the Caisse and are required to maintain adequate warehouse space. Surplus stocks, if any, are stored by the exporters but financed by the Caisse.

Government policy

With the major expansion of coffee acreage occurring in the 1950's and only limited plantings since about 1958 or 1959, most of the tree population passed its prime and production declined. Aware of the serious economic and social consequences of a sharp decline in production the authorities decided to initiate a program to increase the efficiency of production. The first step was to establish a specialized research station, set up in 1960 with the cooperation of the French Coffee and Cocoa Institute.

By 1966, the Government had adopted a 5-year program based on prior research, and designed to renovate and rationalize the industry. The objective was to increase production by at least 40 percent over the average (at that time) of 50,000 metric tons, utilizing only slightly more than one-third of the area than under cultivation.

The land to be taken out of coffee, primarily the east coast area north of Tamatave, was to be used for alternative crops such as bananas, oil palm, cocoa, pineapples, vanilla, and cloves.

The operating agency charged with implementation of this program is the Centrale d'Equipement Agricole et de Modernisation du Paysannat (CEAMP). Financing is provided by the French Government (generally in the form of technicians), the EEC Development Fund, and the local Caisse de Stabilisation.

High-yielding clones have been developed by the Research Center at Kianjavatos, and are being propagated at six regional nursery centers established by the CEAMP. Starting in 1967, nursery trees have been established at these centers at a gradually increasing rate. Since 1969 the centers have produced about 2 million cuttings per year. The nursery stock at the time of its distribution to farmers costs the government nearly 50 francs per tree; it is sold to the farmers for 5 francs.

The objective of the CEAMP is to concentrate production gradually in the hands of the more progressive small farmers. Each would have 1 hectare of coffee, the maximum which could be cared for by family labor, and should produce 1,000 kilograms per hectare, or four times the present national average.

Research

Madagascar has three research stations which have been active in coffee work for a number of years. Most of the effort thus far has been on the development of the high-yielding clones propogated by the CEAMP.

There are no major disease or insect problems affecting coffee in Madagascar, hence, only modest attention is given to matters in this area.

Some research is also underway in an effort to develop a commercially useful variety of coffee from the various species which produce a caffeine-free coffee bean. The work is confidential but one gains the impression that not much progress has been made to date.

Production potential and limiting factors

As indicated above the objective of the government has been to increase production to at least 70,000 metric tons or, alternatively, to produce at least 50,000 tons from about half the acreage. This was to be accomplished through the planting of about 2,000 hectares per year with clonal material, and the gradual abandonment of coffee produced in marginal areas at a rate of about 5,000 hectares per year.

In theory the program is feasible, and the organization and planning capabilities of the action agency, the CEAMP, appear equal to the task. In practice, however, there seem to be many obstacles.

In the first place, it is likely that only a small percentage of farmers can, or will, plant the new trees and most of these will not follow up with appropriate cultural practices. The CEAMP has an inadequate number of field extension agents, each reaching about 50 farmers. Thus, contact has been established with only a small fraction of the approximately 300,000 to 400,000 peasant farmers producing coffee. Secondly, the absence of roads in the growing areas is a serious obstacle to progress; yet the Government admits that road construction is so costly because of mountainous terrain and high rainfall that only a few of the areas of greatest actual or potential production can even be considered for road projects for many years. Finally, long-term foreign financing for the renovation program is by no means assured. When the foreign technicians leave, it is possible that even those peasants incorporated into the new program would gradually revert to their old ways. The new varieties, by themselves, might increase production by 20 to 30 percent; the rest must come from improved cultural practices. Under the current agreement, Malagasy technicians will be trained to take over this program in 1976.

On balance, it appears that the absence of roads in potential growing areas, the small scale of the distribution of clonal material (at most 2,000 hectares per year), and the subsistence-farm nature of the industry, all indicate relative stability of production in coming years, with the CEAMP program counterbalancing the gradual decline in production which might otherwise be anticipated.

Kenya

Kenya represents a striking contrast to its neighbor, Ethiopia. Whereas the latter has excellent ecological conditions for *arabica* coffee in most of the growing areas but backward cultural practices, Kenya represents a triumph of management and research in successfully producing coffee in many areas which are distinctly marginal. The major problem is lack of rainfall. Coffee trees are frequently subjected to water stress in Kenya's main producing areas. As is the case in Ethiopia all of Kenya's coffee is of the *arabica* species.

Coffee was first planted in Kenya around 1900 and the first recorded exports, approximately 145 bags of 60 kilograms, took place in 1909. From that very modest beginning, production and exports increased steadily, reaching a peak in 1935 when the area planted to coffee exceeded 48,000 hectares and exports amounted to 340,000 bags. At this point a decline set in, brought about by the very low world coffee prices of the 1930's and the difficulties of World War II. By 1950, acreage has been reduced by half to only 24,000 hectares, almost exclusively estate owned.

A new expansion started in the early 1950's and the area under coffee expanded rapidly during the next 15 years, reaching a new peak of about 85,000 hectares in the late 1960's. Since that time acreage has declined slightly, but production has held up fairly well:

In 1,000 bags of 60 kg.

1965-66	875
1966-67	935
1967-68	650
1968-69	800
1969-70	900
1970-71	1,000
1971-72	1,000
1972-73	1,265
1973-74	1,100
1974-75	1,100

Africans were not allowed to plant coffee until 1937 and as late as 1955 African smallholders accounted for no more than 10 percent of the land under coffee. During the next few years, however, smallholdings increased dramatically, and at the present time account for approximately two-thirds of total acrage.

Status of the industry

Estates.—Available information indicates about 27,000 hectares in coffee on estates as of 1974, down significantly from 32,500 hectares in 1965, and about the same as in 1955 when the Kenyan coffee industry was much smaller. This downward trend in estates acreage may be expected to continue during the next few years.

Although several hundred estates are said to exist, nearly two-thirds are less than 50 acres in extent. These very small "backyard" enterprises have become increasingly uneconomic during the past few years and are tending to disappear rapidly. Some have shifted to other crops, while many have been taken over by Africans and divided into typical peasant farms combining subsistence crops with some coffee.

On the medium-sized and large estates, cultural practices are technically advanced and yields are correspondingly high. Almost all coffee is planted without shade, at spacing of about 9' x 9' (giving about 1,300 trees to the hectare), pruning is on the multiple-stem system, and trees are customarily fertilized. Mulching is widespread, generally with Napier grass or corn or sorghum stalks. Under the dry conditions prevailing in Kenya, mulching is beneficial in conserving soil moisture, inhibiting weed growth, and providing some organic matter to the soil as it decomposes. Irrigation is also common, particularly on the larger estates, with overhead sprinklers being the method generally employed.

Average estate yields at this time are probably between 900 and 1,100 kilograms per hectare. Although this yield compares very favorably with yields in other coffee-producing countries and is perhaps equaled or surpassed only in El Salvador and Costa Rica, the future for coffee estates in Kenya is not bright. Costs are high and increasing rapidly. Rising labor costs, the need to irrigate, and the expense of controlling (*Colletotrichum coffeanum*) coffee berry disease (CBD) are important elements in the equation. It is likely that estates producing less than 1,000 kilograms per hectare are only marginally profitable. To the economic problems must be added the uncertainties over the future for non-Africans in Kenya. If properties are neglected, owners are threatened with expropriation. Yet, to maintain a high level of productivity requires a large capital investment which many are reluctant to undertake. The result is that the individually owned estate is becoming a thing of the past. Estates are either being sold to Africans and broken up into small farms, or increasingly operated as publicly held corporations. Many estates, also, are reducing acreage in coffee and turning to cattle, tea, or other crops.

Unless coffee prices rise, the only solution for the estates is still higher yields per acre. Given the already high level of cultural practices, the only obvious way to increase yields would be through greater plant density (more trees per acre). However, the availability of soil moisture would be a limiting factor.

All coffee produced is washed coffee. Processing methods are modern, in fact, almost overly meticulous. But the result is a product of high quality, bringing premium prices on the world market.

Small Holdings.—Coffee acreage owned by smallholders has increased with extreme rapidity during the past 15 years, to a total of about 54,000 hectares in 1974. The very large number of peasant farmers involved, most of whom have less than 1 acre in coffee, are grouped together in cooperative societies. In addition to their small plots of coffee, farmers generally plant corn, beans, and bananas, and may own a cow or two or some goats.

Yields on these smallholdings have been very high, for this type of operation, and at times in the early 1960's equaled the per-acre yields achieved by the estates. Most observers attribute this unusual situation to the fact that: (1) Trees were young, since peasants only started large-scale plantings after 1955; (2) smallholders in many instances were occupying lands better suited to coffee and in areas of higher rainfall; and (3) many estates were trimming expenses because of uncertainty as to their future.

Not all small farmers get good yields, however, and in recent years the average has dropped to perhaps no more than 500 to 600 kilograms per hectare. Ministry of Agriculture officials admit they are having difficulty maintaining high yields on estates taken over and divided among African farmers.

Smallholdings also produced washed coffee, with the pulperies and washing and drying facilities being owned and managed by the cooperative societies, rather than the individual farmer. Although the Growers Cooperative Societies are well established throughout the country, there are great disparities in the efficiency and energy of the staffs and administration.

Marketing system

All coffee produced in Kenya, both from estates and smallholdings, must be delivered to the Coffee Marketing Board (CMB) in dry parchment condition. The CMB, an appendage of the Ministry of Agriculture, hulls, grades, and classifies the coffee and conducts weekly auction sales at which coffee is purchased by exporters. There are some 40 licensed exporters at the present time, though the bulk of the crop is purchased by a relatively small number of large firms.

Payments to growers are made on a so-called Pool Year basis. At the beginning of the season the CMB gives the growers a nominal amount, say £ 100 per ton. Later in the season another partial payment is made and, at the close of the Pool Year, after deducting expenses (CMB operates on a nonprofit basis), the CMB prorates the remaining funds to the growers on the basis of average grade of coffee delivered. Receipts of coffee from, and disbursement to, small holders are effected through the cooperative societies.

Research

The main coffee research station at Jacaranda, operated by the Coffee Research Foundation of Kenya, is perhaps the most impressive research station in Africa, and probably should be ranked among the leading such centers in the world. The staff has done a great deal of work in plant pathology. This is to be expected, given the importance of coffee berry disease and the presence of rust. Projects in the field of plant physiology are being increased. This field is viewed as particularly important, inasmuch as coffee trees at their present level of production are being pushed to the limit because ecological conditions in many areas are marginal. Radioisotopes are being employed in the study of root behavior. Variety, spacing, and pruning trials are also underway.

The major effort, of course, is centered on finding an answer to CBD. Although Captafol (Ortho-difolatan) appears to provide reasonably effective control, the amount of spray material required renders the treatment uneconomic unless production is at a high level. The long-term answer is resistant varieties but technicians acknowledge this is probably a 15- to 20-year project.

Production potential and limiting factors

Kenya has the physical potential, in terms of acreage and organization, to expand coffee production to perhaps as much as 1.3 million to 1.5 million bags in the near future. However, it is doubtful if this level of production will, in fact, be attained.

In the first place, the estates face a declining future. Acreage will continue to drift downward and, even though yields per acre may be increased somewhat from their present high level, costs are rising as well. It would be difficult to increase yields very much without great density of planting. This, however, would aggravate the already serious water deficiency. Thus, the outlook for the estates is for slightly less acreage—slightly higher yields—production about the same. In the smallholder sector one can anticipate some further increase in acreage, particularly if the price goes up, and perhaps slightly higher yields per acre. Production, however, would probably not increase more than 10 to 15 percent in the short term.

In recent years a chronic shortage of labor on coffee farms has reached very serious proportions. Aside from the normal migration of rural people to the cities, the problem is compounded by the rise in small farm ownership. Many smallholders now working their own farms are no longer available as hired labor. This problem may trouble the coffee industry in the years ahead.

Another serious and urgent problem confronting both estates and smallholders is coffee berry disease. Although this fungus disease has been present in Kenya for many years it has assumed serious proportions only in the past 10 years or so. In certain bad years farmers in some areas have lost as much as 50 percent of their crops. In recent years the disease has seriously reduced average per-acre yields on small farms, which have thus far failed to cope with the problem as successfully as the estates.

Leaf rust (*Hemileia vastatrix*) also occurs in all areas and if unchecked, especially in the lower altitudes, can lead to serious defoliation and loss of crop. Satisfactory control measures have been established, however. Both rust and CBD are more damaging in years of heavy rainfall. All coffee lands in Kenya are privately owned; hence, the problems of tribal or communal ownership of land are not present.

The prohibition on new plantings was lifted in 1973, but major new plantings are not anticipated.

Tanzania

With the exception of an irregular coastal plain, the terrain in Tanzania rises westward to a rolling plateau at an average elevation of 1,500 meters. There are, however, several discrete mountain ranges, of which the most important is in the north centering on Kilimanjaro, the highest peak in Africa (about 19,400 feet), and Meru. The so-called southern highlands reach a maximum elevation of about 6,500 feet near Lake Rukwa and Lake Malawi. Except in the higher mountain areas, the climate ranges from subhumid to arid.

Several species of coffee grow wild in Tanzania but, as is the case in many other countries of Africa, the presently cultivated varieties were introduced from abroad.

The Bukoba region west of Lake Victoria is known to have produced *robusta* coffee for some three centuries since its introduction by the Bunyoro tribe. At that time the Bunyoro, a tribe from Uganda, had gained control over large areas of the eastern Congo from which they obtained coffee seed.

Arabica seed appears to have been brought to the country by missionaries from the island of Reunion about 1890 and to have been planted in the Kilimanjaro area about 1900. Early plantings were mainly by German settlers. However, following World War I most of the German estates were acquired by Greek and Indian farmers and, at the same time, Africans in large numbers began the cultivation of coffee on smallholdings.

Status of the industry

At the present time, Tanzania is one of the few countries in the world producing both *arabica* and *robusta* coffee. *Robustas* are produced almost exclusively in the Bukoba region west and south of Lake Victoria. This area also produces a rather small amount of *arabicas* which, since they are unwashed, are generally marketed with the *robustas* as "hard" coffees. The main *arabica* growing region is on the slopes and foothills of Mt. Kilimanjaro, with a smaller quantity originating in the so-called southern highlands.

Total production has been quite stable in recent years, after increasing rapidly in the early 1960's, at between 800,000 and 900,000 bags of 60 kilograms each. The 1974-75 crop is an exceptionally large one, and is estimated at about 850,000 bags. The present breakdown between the two types is about 75 percent *arabicas* and 25 percent *robustas*:

In 1,000 bags, 60 kg.

1965-66	660
1966-67	990
1967-68	740
1968-69	950
1969-70	775
1970-71	950
1971-72	850
1972-73	800
1973-74	700
1974-75	850

As is the case in Kenya, Tanzania's industry is divided between estates and smallholdings. All of the *robusta* and unwashed *arabica* from the Lake Victoria area is produced by peasant farmers, as is perhaps 70 percent of the washed *arabicas* from Mt. Kilimanjaro and the southern highlands. Overall, then, smallholders produce perhaps 75 to 80 percent of Tanzania's total coffee crop, with estates accounting for 20 to 25 percent.

Present estimates indicate about 200 estates and some 200,000 smallholdings. Many of the estates and virtually all of the small farmers practice mixed farming and intercropping, primarily with bananas. The small farms average less than an acre in coffee and employ no hired labor.

As might be expected yields from estates are superior to those of small farms, and the gap has been widening in recent years as the estates introduce irrigation and better cultural practices in general, while the smallholder often seems more interested in the sale of bananas than of coffee. Estate yields probably average 1,000 kilograms per hectare, with small farmers averaging about half that amount. Some estates, using fertilizers, sprays, mulch, and irrigation, have obtained yields of over 2,000 kilograms to the hectare.

Processing of the *arabica* portion of Tanzania's production is handled in a manner very similar to that of Kenya. That is, the estates pulp and wash their own coffee, delivering it in dry parchment form to the Tanganyika Coffee Curing Co. Ltd., Moshi, for hulling, classifying, and hand grading. The small farmers deliver the ripe cherry to centrally located pulperies operated by the various cooperatives. These, in turn, deliver dry parchment coffee to the curing works in the same way as the estates. The *robustas* and unwashed *arabicas* from the Lake Victoria area are dried and hulled in the Bukoba area and exported through Mombasa.

The only disease problem arousing concern at this time is coffee berry disease. Although spreading in recent years, the disease is still far less serious than in Kenya. However, as in that country, control measures are complicated because of the overlapping crop cycles (two crops per year). This means that some cherries are on the tree at all times, and early crop cherries provide susceptible material for spore increase which adversely affects the developing late crop.

Marketing system

Since the only curing works (processing mill) for the entire washed *arabica* industry is the Tanganyika Coffee Curing Co. Ltd., located at Moshi, even coffee from the southern highlands, hundreds of miles distant, must be brought to this mill for processing. The mill is owned jointly by the Kilimanjaro Native Cooperative Union (KNCU) and the Tanganyika Coffee Growers Association (TCGA), which represents the estate sector.

After final processing, coffee is sold at weekly auctions conducted by the Tanzania Coffee Marketing Board, in much the same manner as those handled by the Kenya Marketing Board in Nairobi. Purchasers are mostly private exporters, all of whom must be licensed by the board. However, a Government-owned entity, the State Trading

Corporation (STC), is becoming increasingly important in this field.

Payments to growers are based on a pool system which ensures that each grower receives the same average price as all others, depending on the grade of coffee delivered. The grower receives his first payment upon delivery of his coffee at the curing works, his second installment when his coffee has been classified, and the final payment when all coffee has been sold.

Estate coffee, because of its better processing, generally brings a price about 10 percent higher than the smallholders' coffee, but still well below the price usually obtained for the Kenyan estate crop.

Although the Coffee Board does not generally take title to coffee, it is empowered to buy any coffee that cannot be sold through normal channels. Thus, any surplus stocks would be acquired by the board.

There are also numerous cooperative societies, embracing thousands of small farmers, and a Union of Cooperatives which operates a mill in Bukoba.

Government policy

Unlike some other African countries, the Tanzanian Government at no time prohibited new plantings of coffee. Instead, the Government hopes to prevent an excessive increase in coffee production by presenting the small farmers with alternative crops equally, or more, attractive. Examples are dairy cattle in the Kilimanjaro region and tea in the southern highlands and West Lake areas.

Research

The coffee research station, located at Lyamungu, Moshi, was founded in 1934 and enjoys an excellent worldwide reputation for its investigations on *arabica* cultivation and processing. It has been particularly active in studying the interaction between fertilizing, mulching, and irrigation.

Production potential and limiting factors

Almost no land is available in the main *arabica* area around Mt. Kilimanjaro or Mt. Meru to expand production. Some additional land suitable for *arabica* is available in the southern highlands, and more *robusta* could be planted in West Lake Province, near Lake Victoria. Because the quantity of new land is strictly limited, it is clear that the major part of any increase in production would have to come from higher yields per acre. But, with the future for estates unclear, and the smallholder preoccupied with the cultivation of food crops and livestock, increased production is by no means assured.

Government policies will also have an important bearing on the situation. The Government's goal is said to be a society of small family-worked farms, organized in cooperatives. However, in some instances the people lack the experience, education, and administrative ability to run these cooperatives successfully. There are indications as well that the Government bureaucracy is more interested in cooperatives than are the peasants themselves. Farmers are traditionally conservative and African farmers are no exception.

As for the estates, the Government in late 1973 announced the nationalization of all privately owned estates of over 50 acres. It seems inevitable that production will suffer, at least in the short run.

Thus, although the potential for increased production exists, it is more likely that Tanzanian coffee production will increase only slightly, if at all, during the next few years.

Burundi and Rwanda

Before gaining their independence in July 1962, Burundi and Rwanda were governed as the Belgian trust territory of Rwanda-Urundi. In addition to a common political background, the two countries are quite similar as to ethnic and geographic features, as well as the pattern of coffee cultivation. For this reason the two will be considered jointly.

Burundi and Rwanda are small countries of approximately equal size and population. Together, they have the highest population density in Africa with a total population in 1974 of nearly 8 million distributed over only 20,900 square miles.

The topography is generally mountainous and, except for a small area around Lake Tanganyika, varies between about 3,300 and 6,500 feet above sea level. Rainfall is adequate for coffee, with a dry season of 3 to 6 months' duration, depending upon the region.

They are essentially agricultural countries, with the vast majority of the population totally dependent on farming. Most of the agriculture is of a subsistence nature, with bananas, beans, sweetpotatoes, cassava, sorghum, and corn the leading crops. In order to provide the small farmers with a cash crop, the then-governing Belgian administration implemented a large-scale program in the early 1950's to establish coffee whereever ecological conditions were suitable. Concurrently, efforts were made to organize the rural farmers into cooperatives denominated "paysannats." Virtually all of the coffee produced in these countries is *arabica*.

Status of the industry

Coffee production rose rapidly in the 1950's, reaching a total of 600,000 bags of 60 kilograms each in the two countries (then administered jointly) by 1959.

The turmoil and instability which immediately preceded and followed independence in 1962 had an adverse effect on production. By 1963-64 it had fallen to only 275,000 bags, of which 150,000 bags were in Burundi and 125,000 bags in Rwanda. Since that time there has been a steady increase in production:

Year	Burundi	Rwanda
	In 1,000 bags, 60 kg.	
1965-66	200	175
1966-67	240	155
1967-68	315	190
1968-69	275	200
1969-70	240	145
1970-71	350	250
1971-72	400	260
1972-73	355	186
1973-74	350	266
1974-75	400	256

Some differences exist in the soils in the two countries but, in general, they are quite fertile and of good physical properties. The level of cultural practices is also quite high for a smallholder-type operation and is a reflection of the good organization and close collaboration of the farmers with the Government research and extension services.

Since these are landlocked countries, their coffee must move to foreign markets through neighboring nations. Burundi coffee generally moves to Bujumbura, then across Lake Tanganyika, and by rail to the Tanzanian port of Dar es Salaam. Coffee from Rwanda generally goes by truck to Kampala, and from there to the Kenyan port of Mombasa by train.

Outlook

Both governments adopted rather ambitious development programs in the mid-1960's which contemplated the production of 665,000 bags in Burundi and 450,000 bags annually in Rwanda by 1972. The difficulties inherent in implementing so ambitious a program have held production increases to more modest levels.

The Government of Rwanda remains dedicated to the expansion of coffee, its principal export crop, and in 1973 announced the formation of a single company, with government participation, to handle the milling and export of coffee.

Through Burundi, too, hopes to increase coffee production, it is also taking steps to diversify. With financial and technical assistance from the European Development Fund of the EEC, it is moving ahead with projects to expand production of tea, rice, and cotton.

Minor producers

Central African Republic

The Central African Republic's developmental potential, including such crops as coffee, is directly influenced by its geographic location. As a landlocked country situated more than 600 miles from the ocean, it is dependent on transportation outlets through neighboring countries. Most imports and exports move through Congo but the cost of internal freight and handling add to the cost of moving coffee to world markets. Additionally, favorable conditions for coffee exist only in a rather narrow belt of land on the northern side of the Oubangui River. As one moves northward from this zone, the country becomes progressively more arid.

As in other African countries, the major impetus to coffee development took place in the 1950's. By 1960, some 29,000 hectares had been planted. This increased to a peak of 37,000 hectares in 1963 and has subsequently leveled off at about 30,000 hectares. The area in plantations, which reached nearly 20,000 hectares in 1962, has steadily declined and small family farms now predominate.

A 5-year development program, based on financial and technical assistance provided by the EEC, was initiated in 1965. However, it has not made much of an impact on the industry:

	In 1,000 bags, 60 kg.
Average:	
1965/66 - 1969/70	173
Annual:	
1970-71	160
1971-72	175
1972-73	180
1973-74	190
1974-75	180

A major problem is the chronic shortage of labor, which particularly affects the estate sector. Government efforts to expand production of cotton, oil palm, rubber, and food crops also distracts attention and manpower from further development of coffee. Coffee production will probably remain at about present levels during the next few years.

Sierra Leone

Coffee is an important crop in the agricultural economy of Sierra Leone. Nevertheless, after an extensive planting program in the 1950's, acreage and production have stabilized. It is estimated that there are approximately 26,000 hectares of coffee planted in relatively pure stands and an additional 14,000 or 15,000 hectares interplanted with other crops. The main areas of production are the central and eastern provinces. These provinces border Liberia.

Because of occasional cross-border movements of coffee between Sierra Leone, Liberia, and Guinea, it has not always been easy to determine the trend of local production. It appears to have ranged in recent years from about 100,000 to 130,000 bags, as indicated in the following table.

In 1,000 bags, 60 kg.

Average:	
1965 66 - 1969 70	90
Annual:	
1970-71	125
1971-72	95
1972-73	135
1973-74	67
	133

There are substantial reserves of land suitable for growing coffee in the southeastern and southwestern provinces. Nevertheless, no rapid increase in production is foreseen in the next few years. All coffee is produced on small farms in the traditional way.

The Government has .had a long-standing practice of subsidizing fertilizers and pesticides to the coffee sector and also appears to be stepping up its efforts to control border traffic.

Togo

Togo is a very small West African country located on the Gulf of Guinea and bordered by Ghana and Dahomey. The economy of the country is essentially agricultural, with coffee and cocoa the two leading export commodities. There are no estates and the average smallholding averages perhaps no more than 2 hectares. However, in the western coffee zone, bordering on the Republic of Ghana, farms are somewhat larger with some having as many as 10 hectares under cultivation.

Most of the coffee area was planted in the 1950's and since that time acreage has remained at about 40,000 hectares. Reserves of land with climate and soil conditions suitable for coffee are virtually exhausted so that future increases in production would have to come from improved cultural practices leading to increased yields per hectare. Despite an unusually high tree density of about 1,600 trees per hectare, current yields are low, probably no more than 300 kilograms per hectare.

In 1965, a 5-year development program was initiated, designed to raise production to an average of about 300,000 bags per year through more intensive cultivation of the existing area. However, perhaps because of a lack of adequate research or extension services, or because of greater interest in the growing of food crops, progress was slight.

In recent years, production has been stable at an average of about 200,000 bags per year. Little change from this figure is anticipated in the future.

Others

Coffee is also produced in a number of other countries in Africa, the most important of which (in terms of coffee production) are Equatorial Guinea, the Republic of Guinea, Liberia, Nigeria, and Ghana. Total production from all of these combined, together with extremely small amounts from Congo, Dahomey, and Gabon, generally does not exceed 500,000 bags per year.

In all cases, coffee is produced by small farmers using very primitive techniques. There seems to be little interest in expanding production, and the outlook is for harvests to remain at about present levels, at least for the next few years.

Outlook

What are the prospects for further growth of Africa's coffee industry in the years ahead? On the positive side are the ecological conditions which, over wide areas of Africa, are extremely favorable for one or the other of the two commercially important species of coffee. Favorable soils, adequate and well-distributed rainfall, varying elevations above sea level, and reasonably abundant (in some areas) and cheap labor make possible a continued increase in production of coffee of differing types and qualities. In addition, there remains a vast storehouse of indigenous coffee material in the tropical and subtropical forests of the continent from which new germ plasm may be obtained to further improve the quality characteristics or disease resistance of the presently cultivated varieties.

It is true that *arabica* production, presently constituting about 25 percent of total African output, is limited due to the presence of *Hemileia vastatrix* and *H. coffeicola*. Also, since *arabica* responds poorly in a continually hot environment, its successful cultivation is limited to the higher elevations, principally in the Cameroon, the Kivu region of the Republic of Zaire, Burundi, Rwanda, Kenya, Tanganyika, and Ethiopia. Smaller amounts of *arabica* are also produced in Uganda, Madagascar, and Angola. In most of these countries the possibilities for increased production of *arabica* are not good; Ethiopia, however, offers a tremendous potential for increased output of high quality *arabica*.

In the case of *robusta* coffee, the possibilities for expansion are greater. Here, one critical element is the extent to which *robusta* may be able to compete for world markets against lower grade *arabicas*. During the past decade, exports of *robustas* have ranged from 26 to 30 percent of total world exports, averaging 28 percent. *Robusta* has enjoyed its greatest success in the United States where it has increased its share of the market from only 9.1 percent in 1959 to a peak of 28.8 percent in 1970, dropping back slightly to 26.4 percent in 1973.

In Europe *robusta* has also done well, as exports to that area increased from 5.7 million bags in 1963 to 8 million bags in 1973. However, in percentage terms *robustas'* share of the market fell from 28.3 percent in 1963 to 26.2 percent in 1973. One factor to note, which may be significant in the future, is that in 1963 *robustas* were sold in volume in only four countries of Europe—France, Italy, the Netherlands, and Great Britain. By 1973 they were imported into virtually all European countries.

Despite the favorable ecological conditions and the relative success of *robusta* in penetrating more and more markets, it is nonetheless somewhat uncertain as to whether African coffee production can increase significantly in the near future. The main obstacle to such expansion is the structure of the industry.

Coffee in Africa is, on the whole, a smallholders' crop. In many countries the average farmer owns no more than 100 to 200 trees, while the majority have perhaps no more than 1 or 2 acres in coffee. There are a few large estates, particularly in Angola, Kenya, Zaire, and Tanzania, but in all of these countries their numbers are declining. In Angola, present political instability and a shortage of labor in the important northern coffee sector are also adverse factors.

Production increases in the past were achieved mainly through acreage expansion. This phase is largely over. Future increases must be based on modernization of the industry and adoption of technology which will greatly improve yields per acre. Improved quality through better processing is also essential if *robusta* hopes to expand its markets and successfully compete with *arabicas*.

Modern techniques, unfortunately, are generally accompanied by increased inputs and higher costs. Many experts consider that for coffee cultivation to be a paying proposition it must be carried on either on completely traditional lines, with a minimum input of capital, primitive techniques, and consequent low yields or, on the basis of the most modern technology, requiring a large capital investment and expert management, but giving very high average yields of 1,000 kilograms per hectare or more. The intermediate stage between the two, in terms of inputs and yields, represents a serious challenge and often results in financial loss. Yet to make the jump from primitive, low-yield (where most Africans now find themselves) to modern, high-yield techniques may be beyond the financial and managerial capacity of many African producers.

Whether the African countries can successfully meet the challenge remains to be seen. It seems more likely that, despite the potential, increases in coffee production will be slow over the next few years.

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